

# **Introduction to Business Process Analysis Graphical Modeling**



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# **Introduction to Business Process Analysis Graphical Modeling**

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## Overview

Business Process Analysis uses an interconnected scheme of graphical models to fully define and illustrate the components of each process. In this paper, we outline two types of graphical models that will support the business process analysis of the workgroup: context diagrams, which define the operating environment of a given process, and task flow diagrams, which we will use to present the relevant tasks to accomplish that process.

Context diagrams give us an overall structure of the entire environment in which a process takes place. They help us make sure that we are identifying all entities and transactions between entities—key transfer points where information systems need to convey information.

Task flow diagrams help us specify the discrete tasks that occur within a particular entity. Discrete tasks are those which can be performed by an individual or group without interruption once the task has started.

While context diagrams and task flow diagrams give us a “picture” of the business process, these graphical models are not enough for individuals to understand the backbone behind the processes – the goals, objectives, business rules, etc. The business process matrix used in conjunction with the graphical models provides at a glance the pertinent information about a business process during business process analysis.

The nature of collaboration will require ongoing dialogue within the workgroup to define the processes to be included, i.e., those that are broadly accepted within the public health organization, as well as to define the characteristics relevant to that process, again considering the broad application of the tool. The workgroup will be challenged to consider the implications of a narrowly-defined process, or an entity that is not universal to public health organizations. Consequently, the products of the workgroup will be further defined at the local level, customized to meet the unique range of variables that affect the way each organization takes care of the business of public health in their community.



# **Introduction to the Business Process Matrix**

# What is a Business Process?

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## Background

Although the term “business process” has been widely used in industry to describe the way in which organizations conduct their activities and achieve specific goals and objectives, the term is not commonly used in public health.

The first step in understanding the business processes of public health agencies is to understand the definition of a business process and how the work of public health agencies can be modeled within that context.

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## Characterizing a business process

An organization or industry defines the term “business process” according to their unique characteristics. The following, when considered together, are common characteristics of business processes.

A business process:

- Is in response to a trigger event
  - Is a collection of activities or steps (tasks)
  - Involves entities/participants
  - Rarely takes place in isolation. It may be comprised of activities that span across and/or within multiple business units such as departments, organizations, divisions, or branches.
  - May contain inputs from and outputs to other business processes
  - Can be part of a larger encompassing process
  - Can be viewed at various levels of granularity
  - Has a clearly defined objective or purpose
  - Contains entities that work toward a common goal
  - Produces something of value for the benefit of an organization, stakeholder or customer
  - Has an outcome that is measurable and may be assigned parameters for establishing performance gains
  - Meets customer and/or stakeholder needs and expectations
  - Involves the flow of material and/or information (transactions)
  - Has a known method or set of business rules, also known as an algorithm to define activities. When the method is applied to the input, certain outputs are created as a result of the business rules.
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## Components of a business process

Drawing from the common characteristics, a business process will include each of the following components, at a minimum:

- Entities
  - Transactions
  - Goal
  - Objective
  - Business Rules
  - Trigger
  - Task set
  - Input(s)
  - Output(s)
  - Outcome(s)
- 

## Defining a business process

Within the public health milieu, a business process is defined is described using the following criteria:

- Depicts all of the people, groups of people, organization, and other systems (**entities**) that perform one or more tasks
- Includes all key exchanges of information and materials (**transactions**) between entities
- Describes the health **goal** that is supported by the business process
- Contains a concrete description or **objective** of what the business process seeks to achieve
- Reflects the policies, laws, procedures, and constraints (set of **business rules**) that are imposed upon the agency as it performs works
- Identifies the event, action, or state (**trigger**) that initiates the activities of the business process
- Describes the set of tasks (**task set**) that are performed
- Includes information and materials received from (**inputs**) or transferred to (**outputs**) other business processes
- Has an **outcome** that is intended to satisfy the objective

A detailed definition with examples for each of the business process components appears in the glossary of the report *Taking Care of Business (2006)*.

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## The Business Process Matrix (BPM)

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### **What is the business process matrix? (BPM)**

We use textual and graphical components to develop a complete model of the business process. During business process analysis, workgroups use graphical modeling tools to describe in detail the entities and transactions (context diagram) as well as the tasks (task flow diagrams) within each business process. The business process matrix (BPM) is a table that outlines the components of a business process that describe the process (goal, objective, business rules, trigger, inputs, outputs, and outcome). The BPM is designed to be used as a quick reference for groups who are analyzing business processes. It is useful as a reference when developing graphical models such as context and task flow diagrams to keep everyone thinking of the same objectives.

The BPM is also useful to collaborative workgroups. The BPM helps to establish shared definitions of business processes and provides a record for keeping track of and refining multiple business processes as they are being defined. For example, it is easy to see when using the matrix when two or more processes share enough characteristics to be combined into one business process.

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### **What does the business process matrix look like?**

The business process matrix is a table with eight columns. Each column represents a component of the business process description. Each row describes a single business process.

There is an example of a business process matrix on the following page. The example contains definitions for each column in the matrix and one business process for *Freddie's Fast Flippers*, a fictional burger chain. For examples related to public health, see pages 30 and 31 in the Institute's publication, *Taking Care of Business*.

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## Business Process Matrix: Definitions and Example of One Process

<b>Process Name</b>	<b>Goal</b>	<b>Objective</b>	<b>Business Rules</b>	<b>Trigger(s)</b>	<b>Task Set</b>	<b>Inputs</b>	<b>Outputs</b>	<b>(Measurable) Outcomes</b>
	<i>The major health goal that the business process supports. The goal is the end state to be achieved by the work of the health agency and should be defined in terms of the benefits provided to the community/ population or individual/client.</i>	<i>What the business process seeks to achieve. The objective should be specific to the process such that one can evaluate the process or reengineer the process and quantify performance measures. A well-worded objective is SMART (Specific, Measurable, Attainable/Achievable, Realistic and Time bound).</i>	<i>A set of criteria that defines or constrains some aspect of the business process. Business rules are intended to assert business structure or to control or influence the behavior of the health agency (business).</i>	<i>Event, action or state that initiates the first course of action in a business process. A trigger may also be an input, but not necessarily so.</i>	<i>The set of activities that are carried out in a business process.</i>	<i>Information received by the business process from external sources. Inputs are not generated within the process.</i>	<i>Information transferred out from a process. The information may have been the resulting transformation of an input, or it may have been information created within the business process.</i>	<i>The resulting transaction of a business process that indicates the objective has been met. Producing or delivering the outcome satisfies the stakeholder of the first event that triggered the business process. Often, measures can be associated with the outcome (e.g., how much, how often, etc.).</i>
<b>Example of a Process: Freddie's Fast Flippers (fast food restaurant)</b>	Timely provision food and service to the customer at the best value	Accurately process food order for and receive payment from drive-through customers in a minimal amount of time	<ul style="list-style-type: none"> <li>➤ FDA standards for food handling</li> <li>➤ Cashier does not handle food</li> <li>➤ Cashier provides greeting and acts as point of contact for all food stations</li> </ul>	Customer arrives at drive-through station	<ul style="list-style-type: none"> <li>➤ Greet customer</li> <li>➤ Take order</li> <li>➤ Process order</li> <li>➤ Give customer total and receive payment</li> <li>➤ Receive and deliver order to customer</li> </ul>	<ul style="list-style-type: none"> <li>➤ Food and beverage inventory</li> <li>➤ Inventory of paper goods (bags, straws, napkins)</li> </ul>	<ul style="list-style-type: none"> <li>➤ Inventory orders</li> <li>➤ Sales activity reports</li> <li>➤ Deposits</li> <li>➤ Incident reports</li> </ul>	<ul style="list-style-type: none"> <li>➤ Payments received</li> <li>➤ Timeliness of order fulfillment</li> <li>➤ Number of customer complaints</li> <li>➤ Incident reports</li> </ul>

## Using the Business Process Matrix to Define a Business Process

### Start with the goals and objectives.

The most important step is for the workgroup to agree on the goal and the objective(s) of a business process. While the goal explains how the business process supports one or more of the goals of public health, the objective is a concrete statement describing what the business process is trying to achieve in support of this goal. The objective should be written at a low level so that it can be evaluated at the conclusion of a project to see whether it was achieved or not.

Objectives often begin with an action verb such as increase, reduce, improve achieve, etc.. A well-worded objective will be SMART:

- **S**pecific
- **M**easurable
- **A**ttainable/Achievable
- **R**ealistic
- **T**ime bound

In a collaborative setting, the objective must be written in a way to support multiple organizations. Although there may be more than one objective in a business process, normally, there are usually only one or two *primary* objectives. For example when a restaurant fulfills an order, two primary objectives are (1) to provide an accurate order to the customer as well as (2) to receive payment. Depending upon which part of the process is under analysis, there are other objectives of this process including: inventory control, collecting customer demographic data. During business process analysis, the business analyst will use the BPM to clarify with the group the primary objectives and outcomes that are under consideration.

Having too many dominant objectives associated with one process may indicate a need to divide the business process into multiple processes.

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### How will you determine if you have met your objective?

The outcome of the business process is the transaction that determines whether or not the objective(s) have been met. When completing the BPM, the group will need to determine which action or transaction in the business process satisfies the objective and completes a cycle of the process. For example, the delivery of the completed customer order, and the receipt of payment are the outcomes for the order fulfillment business process in our discussion.

When the context diagram is created, it is important that the transactions shown include the outcome.

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**What sets the business process into motion?**

After identifying the objective and outcome, the workgroup should agree on what triggers the business process. The trigger is an event, action or state that initiates the first course of action in a business process. A trigger may also be an input from another business process, but not necessarily so.

Identifying the trigger enables the group to proceed forward in describing the events of the business process. Identifying and agreeing on the trigger is important since it is used to begin the process of context analysis. The trigger appears on the context diagram as a transaction.

The remaining components of the BPM may be identified in any order through collaborative discussion. The group will often find that they will want to revise the descriptions within the matrix as more of the business process becomes defined. There should be someone who accurately collects the ideas that emerge and the final version should be documented.

The following sections describe what is necessary to complete the remaining columns of the BPM.

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## **Understanding the rules of the business**

Once a business process is in motion, the activities are guided by the business rules. The business rules are the logic used to make decisions during the business process. Business rules may be based on policies and procedures, such as legal requirements, organizational standards, or other operating procedures related to that business process. The workgroup should use the BPM to record any known policies, guidelines, and constraints that will influence, guide, or limit activities during the business process.

During task flow analysis, the business rules are considered at decision points within the work flow. Using the order fulfillment business process as an example, we can look at the point in the work flow when the customer service agent checks to see if the completed order is available. This is a decision point: Is the order available? Yes or No. The business rules are used to decide which actions take place based on the answer.

Tradition and culture are sometimes the only known reason that some activities are carried out in certain ways. When this phenomenon occurs, there is a tendency to loosely refer to such restrictions as business rules.

In actuality, these are unwritten procedures that guide behavior within an organization. They can often be identified when an action is justified or explained only in these terms: "This is the way we've always done things around here." Most often, there is no documented procedure in place to support this action.

During business process analysis, the business analyst will challenge the validity of maintaining certain traditional or "undocumented" activities if those activities get in the way of effectively meeting objectives.

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**What activities take place during the business process?**

The workgroup can use the task set column of the BPM to brainstorm and jot down the types of activities that take place during the business process. This high-level summary of the main activities is the *task set*. At this point, the description of the tasks is in a summary format. For example, a few of the tasks listed in the matrix for the immunization administration process include: perform client intake; prepare inventory; administer vaccines; and educate clients. The tasks summarized in the BPM will be described in more detail later during task flow analysis (see *Introduction to Task Flow Analysis*).

By detailing this task on the BPM, the workgroup maintains consensus about the activities being analyzed within the business process.

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**How does the business process relate to other business processes?**

Defining the inputs from and outputs to the other business processes in an organization helps the workgroup members and the business analyst understand the various constraints that are exerted externally on the business process. For instance, an input from a process that contains an existing information system or an output to a process that uses another information system can present special considerations for the business analyst when gathering the requirements for any information system to be used to support the process under analysis.

The BPM is used to keep track of the inputs and outputs. The workgroup will record known inputs from other processes into the BPM. During context analysis, the context diagram and BPM are compared against each other to insure that all inputs into the process are incorporated into both models. Although some outputs can be listed prior to context analysis, it is easier to capture the outputs for the matrix after the context diagram is completed.

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**Who participates in the business process and what information is exchanged?**

The participants of the business process are called *entities*. An entity is defined as: A person or a group of people who performs one or more tasks involved in a process. The entities are the participants in the process. The exchanges of data or material between entities are transactions.

It is important to understand that an entity does not always refer to an individual. An entity may be an organization, a department within an organization, a certain classification of the public (such as “media” or “infected patients”), or even another information system. For example, in the Immunization Administration business process, the immunization registry is considered an entity because it is accessed directly during the immunization process.

For our purposes, instead of including entities and transactions in the business process matrix, the workgroup will use a graphical model called a Context Diagram to model the entities and transactions. In context analysis, entities are represented by circles and transactions are shown as directional arrows.

Please refer to *Introduction to Context Analysis* for more details on using context diagrams for modeling during business process analysis.

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**What do we do with the completed BPM?**

Before the graphical models are created, the information provided in the BPM acts as a framework to guide the development of the graphical models. It may not be complete, however it contains the information needed to support the models, as they are described in *Introduction to Context Analysis* and *Introduction to Task Flow Analysis*.

For example:

- The trigger identified on the BPM is used to begin the context diagramming process.
- The outcome identified on the BPM should also appear in the context diagram and the group will need to determine whether or not the correct outcome has been selected to evaluate.
- The task set is used to identify what work will be analyzed in task flow analysis. And business rules listed on the BPM are used to make decisions within the workflow during task flow analysis.

The BPM is continually updated during the diagramming process. The workgroup should use information gained in developing the context diagrams and task flow diagrams to expand the BPM.

Ultimately, a completed BPM will be used to develop the textual detailed description of each business process. It will also be used to keep a list of business processes and to determine whether or not two or more business processes should be combined or split apart.

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**Defining additional business processes using the BPM**

The workgroup will determine how narrowly or broadly a business process is defined. In the effort to develop a collaborative definition for the work of public health agencies, it can be challenging to determine the level of specificity for the BPM. Should the business processes be expressed in broad terms encompassing many activities and participants such as “environmental safety inspections?” Alternatively, is it more useful to identify specific program-oriented processes, such as the activities that are carried out during on-site sewage disposal approval or restaurant inspection?

Broad definitions of business processes lend the advantage of being very adaptable for many different organizations. However, the more tightly defined business processes give a more accurate sense of the actual work that is done by a single organization and where process improvements or information systems could be useful. Depending upon the project goals and scope for a collaborative group, the BPM is a tool that can help normalize the discussion.

# **Introduction to Context Analysis**

# What is Context Analysis?

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## Background

Traditionally, computer application software requirements have been determined through the use of various requirements gathering activities. The activities centered on identifying which users to interview, and then asking what functionality they would like to see in the system. The process was rather unstructured and learning occurred in a random fashion without a consistent method to include all system interfaces. Each interviewee concentrated on their particular interest or current problem, often relating very detailed information to an analyst who was not yet familiar with the given environment. Gathering requirements in this way is open-ended and does not include a method to determine if any system interface has been overlooked or omitted.

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## Purpose of context analysis

Good analytical techniques provide a mechanism for building frameworks and then progressively and systematically overlaying the details. Appropriate tools help control and bring order to the information exchange process, which is crucial to successful requirements gathering.

Context analysis is used to bring focus and direction to the initial portion of the requirements gathering activity. It is specifically designed to help the analyst build a framework for defining the requirements for that process. The tool employed in support of context analysis is called a *context diagram*.

Context diagramming is not a technical science, with exacting rules and regulations. The intent is to provide a graphical tool to aid in the understanding of the work environment.

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## What is context?

In business process analysis, context refers to the environment in which an organization performs a number of activities involving one or more distinct groupings of individuals for the purpose of achieving one or more organizational objectives. This information about the context of the activities will be used to support later analyses of the sequence of those activities.

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## Components of Context Analysis

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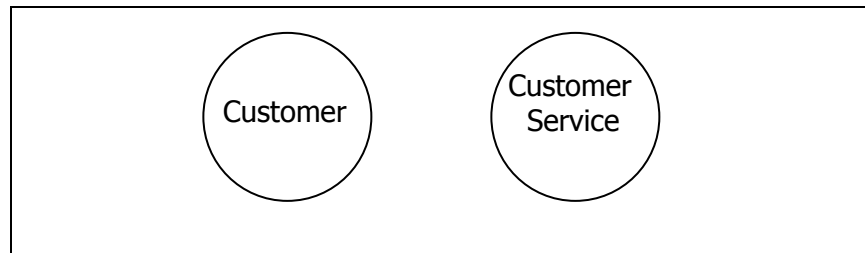
### Entities and transactions

Context diagrams contain two components: *entities* and *transactions*.

**Entities** may refer to individuals, such as Accounts Payable Clerks, or groups of people, such as the Accounts Payable Department. Entities may be internal or external to the organization. They may include other organizations as well as other information systems. They are active participants in the process, not simply passive conduits used to transmit or convey information or physical objects. Entities are represented by circles, with the name of the entity stated inside the circle.

Let's look at an example. This example refers to the process of a customer getting an estimate on car repairs.

The first thing that happens is that the customer goes to the repair shop and speaks to a customer service representative about the repair needs. We have two entities—the customer and the customer service department—which could be represented like this:

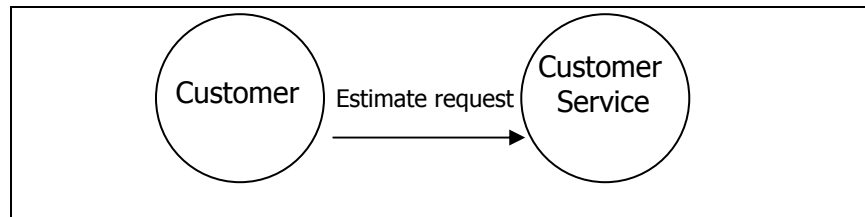


**Figure 1**

Entities relate to one another through **transactions**. Entities perform actions on transactions that alter the content of the information or physical objects being passed around the organization.

Transactions are represented by arrows with the head of the arrow pointing to the entity to which the transaction is being directed. The foot of the arrow originates from the entity sending the transaction. Transactions should be labeled to indicate the general content of the information.

Therefore, we can add the following transaction arrow to our example:



**Figure 2** shows the very beginning of a context diagram.

## How to Develop a Context Diagram

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### **How context diagrams are developed**

The objective of the context analysis is to develop a context diagram. The first step is to identify the entities involved, and define the transactions that occur between them for a given business process. Once this relationship has been described, the analyst can then ask for the name of another entity involved in the environment, and the transactions linking it to the other two entities. The process is simply repeated until a complete description of the environment emerges.

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### **Advantages of this approach**

This approach has several advantages:

- It allows all the key participants to get a feel for the overall environment. In many instances the key users associated with each internal entity understand their own particular contribution to the environment, but may not have a good understanding of the role played by the other entities involved. Joint development of the context diagram encourages and promotes a global rather than local view and understanding on the part of each participant.
  - It focuses the project on the overall environment and objectives rather than individual parts. In essence, it helps develop a macro rather than micro project view, which puts all the participants on the same team, rather than competing with each other to have their needs met.
  - This approach speeds up the requirements gathering process because it creates an environment for the orderly progression of areas to be explored. It avoids “random walks” through the requirements gathering process.
  - It reinforces the delineation of overall purposes and objectives for the environment, rather than the secondary objectives of each entity.
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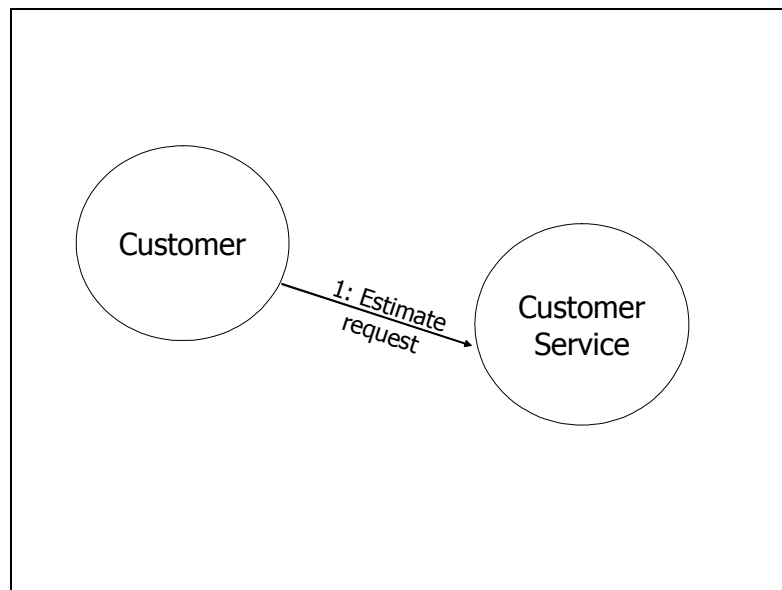
### Requirements to complete context diagrams

In order to create context diagrams that are complete and accurate, we must have the following:

- A workgroup that collectively has a good understanding of the process being described.
  - The workgroup must participate in one or more group sessions, because discussion is required to make sure that the process is correctly diagrammed and everyone understands the diagram. Therefore, context diagrams are best completed in a collaborative group environment, rather than in a series of one-on-one interviews with subject matter experts (SMEs).
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### An example of context diagramming

Let's develop our repair example, which so far looks like this:



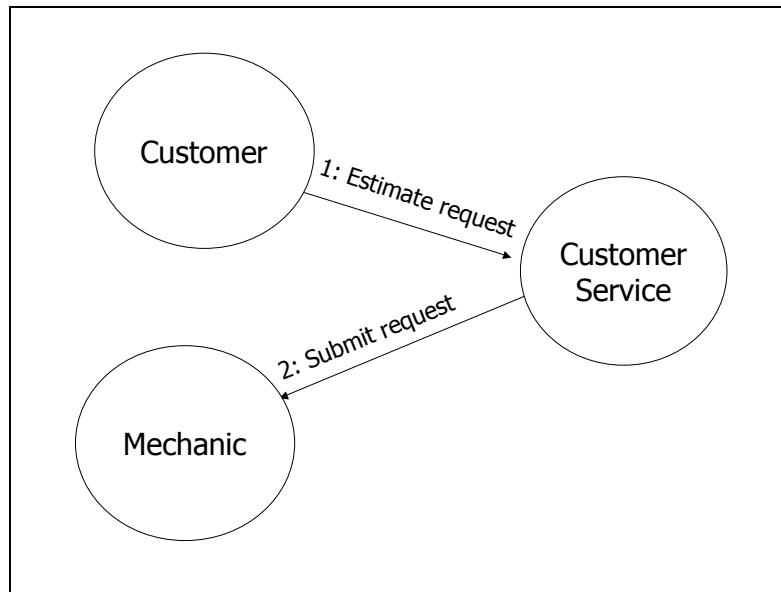
**Figure 3**

The next logical question is, "What does the Customer Service Department do with the request when it is received?" The response is that the customer service representative communicates the specifics of the job to a mechanic.

*\* Note: The transactions in this example are numbered to make it easier for you to follow the sequence in which the diagram is developed, but often context diagrams cannot be numbered so neatly, due to multiple parallel subsets of transactions.*

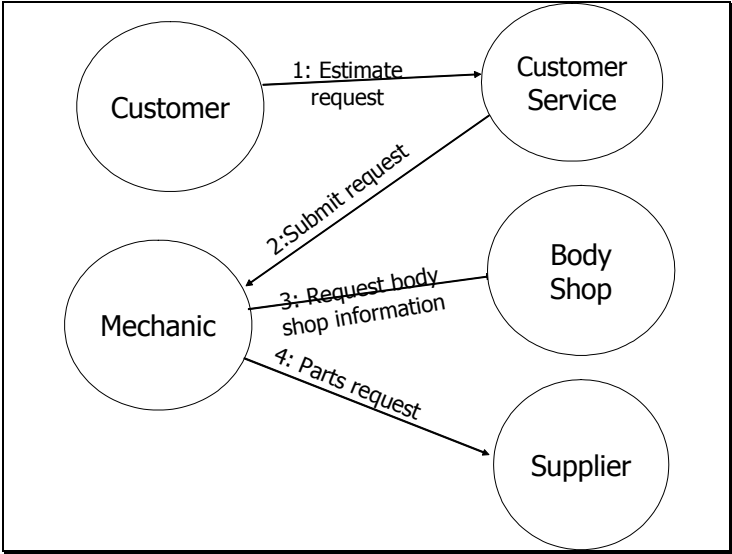


Thus there would be a transaction between the Customer Service Department and the mechanic as follows:



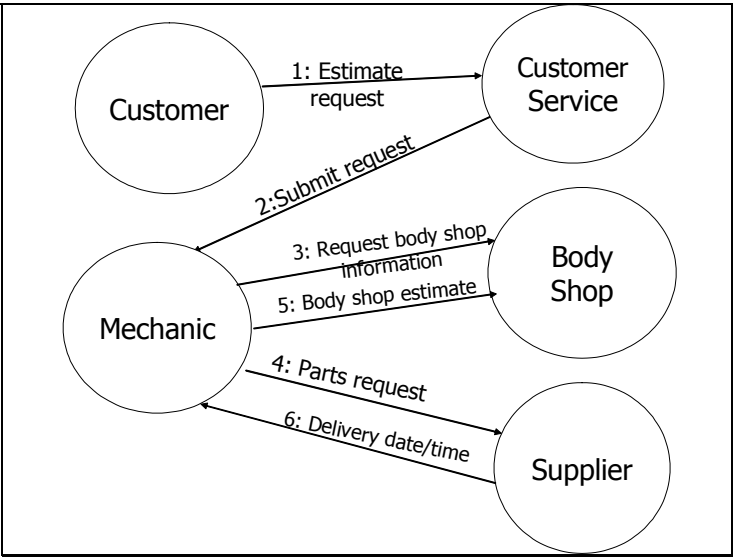
**Figure 4**

The facilitator, a business analyst, continues to develop the diagram by asking the workgroup a series of questions. The next question, “What does the mechanic do with the request?” generates the response that the mechanic determines the work required and asks two other entities—a body shop and a parts supplier—for additional information. The body shop must perform some of the work as a contractor, and the parts supplier must commit to when they can send any needed parts. At this point, our diagram looks like this:



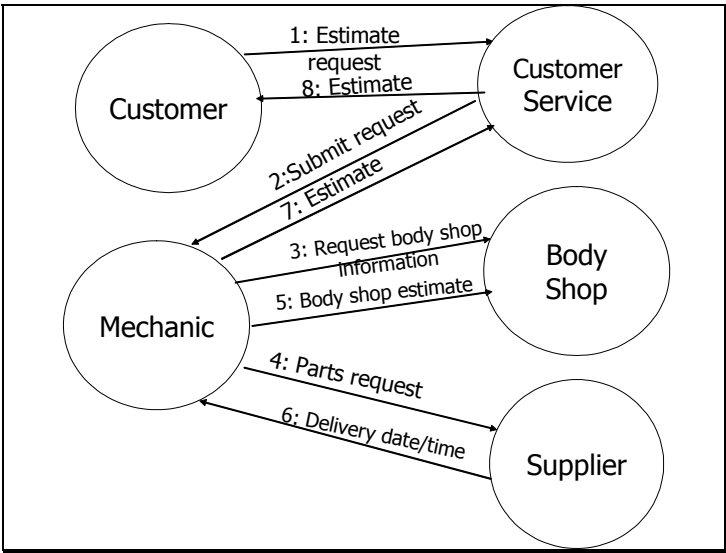
**Figure 5**

Again, we ask: "What do the body shop and parts supplier do with the mechanic's request?" While there may be some internal processes in the body shop, the next two transactions involve estimates to the mechanic. The addition of these two transactions would look like this:



**Figure 6**

In the next step, the mechanic takes this information, along with his/her own assessment of additional parts and labor, and sends the completed estimate back to customer service, who then calls the customer with the final estimate, as illustrated below:



**Figure 7**

The customer now has the requested estimate and can make a decision whether to approve the work. This completes the context diagram.

The overall objective is to get the customer an estimate, and the transaction showing customer service representative giving the estimate to the customer represents the achievement of the objective. This diagram would be a part of a larger context diagram if the entire repair cycle, from estimate to completion of repairs to paying of the bill was studied. However, our objective in this case was to delineate the environment associated with the estimation process.

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**When context  
diagramming is complete**

As we saw in Figure 7, the business analyst and workgroup must make a decision about what to include in the diagram and what should rightfully be part of a new diagram for a different process. Having a clear objective of the process helps the workgroup to agree on which transactions indicate the objective has been met. For instance, in the mechanic example, the objective – to deliver an estimate to the customer – was met by the final transaction to the customer from the customer service department.

How do you know when the diagram is complete? How does one confirm that the diagram represents the process? In most cases, the users can confirm completion of the structure by checking to see whether all entities are documented. It is more difficult to assess whether the transaction set is complete. The following suggestions can help determine the adequacy of the transaction set, however they do not guarantee completion. The design of a task flow diagram provides additional feedback on the adequacy of the transaction set, and additional transactions can be added at that point. This is yet another example of how the graphical models are interconnected. Additionally, it is helpful to review the work product from the following perspectives:

- For each transaction pointing towards an entity is there a corresponding transaction generated by the entity as a result of some activity performed by the entity? Transactions can be viewed as “triggers” for specific work activities within a given entity that produce work products distributed to one or more other entities. If an incoming transaction does not logically trigger an outgoing transaction, one of three things is true: (1) The diagram is complete and the objective of the process has been met. (2) You don’t completely understand the environment. The resultant outgoing transaction is present on the diagram, but you don’t understand how the incoming transaction triggers the creation of the outgoing transaction. (3) One or more transactions need to be added to the diagram.
- Do all *external* entities have at least one transaction arrow with an internal entity? In any process under consideration the external entities must be directly related to the process being studied. For example, if the organization we are describing has a vendor from which we purchase items, we are not interested in that vendor’s subcontractors, nor normally will the organization of interest have a direct relationship with the subcontractor. This is a boundary rule that prevents us from trying to describe a whole industry or economy, rather than the specific business process.
- Do all entities both receive and send transactions? Usually, entities will both receive and send transactions if they are an active participant in the environment being described. Any entity not both receiving and sending should be inspected for missing transactions.

Although not foolproof, these suggestions will enable the analyst to assess whether the diagram is complete. These criteria support the requirements gathering tasks. It is not necessary to have a perfect representation of the activity within a target environment, because there is an ongoing opportunity to refine the diagram as new information becomes available. If the users are satisfied regarding the description, and the three questions posed above can be answered in the affirmative, you are ready to proceed to the next step in the analysis.

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# **Introduction to Task Flow Analysis**

## What is Task Flow Analysis?

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### Purpose of task flow analysis?

In context analysis, we map out the *environment* in which tasks occur, showing all the entities in a business process and the transactions among them (see *Introduction to Context Analysis*). However, when creating context diagrams, we do not consider the activities that occur *within* each entity. Task flow diagrams are a tool for us to portray these activities, or tasks.

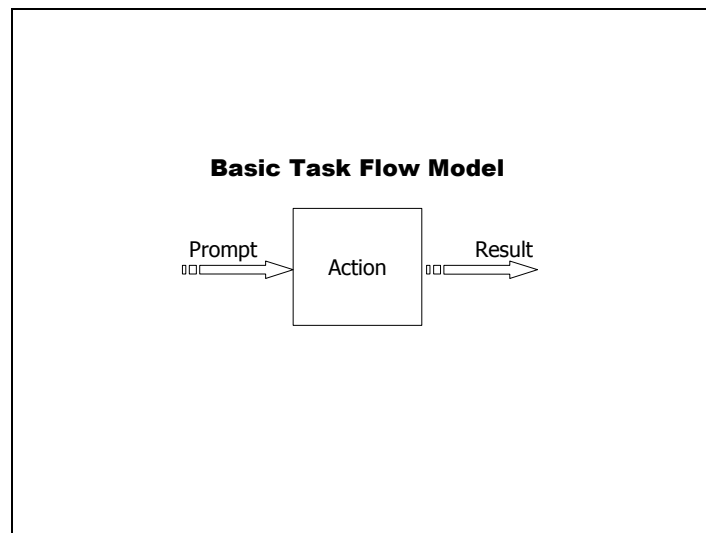
Task flow diagrams proceed from, and are more detailed than, context diagrams. Key tasks—those that are most important to identified requirements—are described in more detail in task flow diagrams.

Mapping out important tasks gives us more detail about how the information systems can support activity within a business process.

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### What form do task flow diagrams take?

Task flow diagrams identify the various tasks required to achieve the organizational objective summarized in the Business Process Matrix. The diagrams also show the interrelationships among tasks because results from one task are used as prompts to others. Each task conforms to the model of prompt → action → result as depicted in Figure 8. This process is similar to the data processing model of input, process, and output. We will use the terms prompt and result in this document to avoid confusion with the terms input(s) and output(s) which are used to describe transactions in the business process.

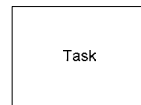


**Figure 8**

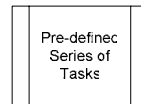
Task flow diagrams look like standard flowcharts. Therefore, they have the following qualities:

- There is a prompt or starting point.
- There are one or more activities or tasks performed on the input to create a result.
- They are read from left to right or top to bottom. Task flow diagrams are networks with a single direction of flow.
- Standard flowcharting tools are used—rectangles, arrows, diamonds for decision points, etc. The following figure provides a legend for the common symbols used in task flow analysis.

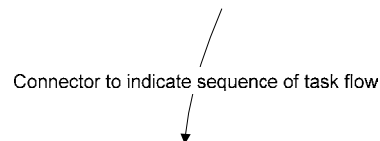
### Examples of task flow symbols



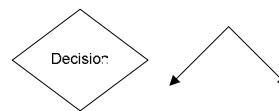
A 'task box' depicts an activity or series of activities that can be performed by an individual or group from beginning to end without interruption (from another entity or task).



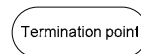
A box with parallel lines along each side is a short-hand symbol to represent a series of tasks that is grouped together to execute a specific operation.



Lines with arrows are drawn to connect symbols and to indicate direction of task sequencing. Task flows are read from top to bottom or from left to right.



A decision 'box' (really a diamond or rotated box) shows an "either/or" condition is being invoked by the entity performing the work. Depending upon the answer to the question posed within the diamond, one of two or more courses of action will be followed. Sometimes the actual box is implied with the use of split arrows.



A rectangle with rounded corners is the symbol used to identify the beginning and end to any series of tasks.



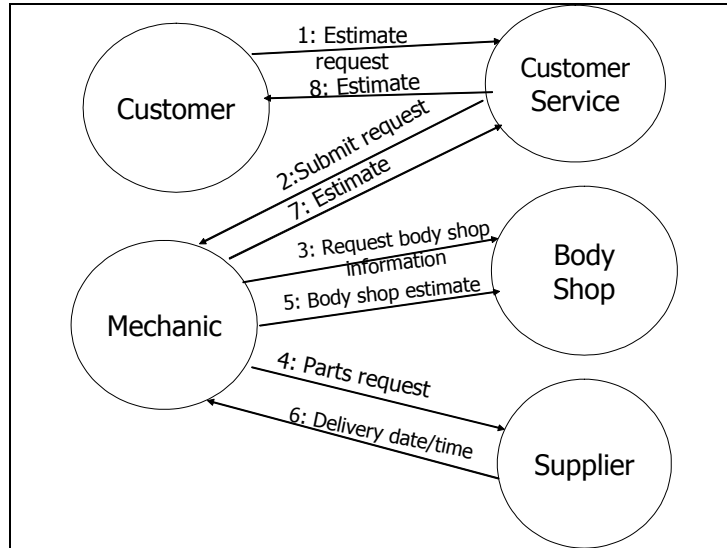
The on and off-page connectors are used to show that a sequence of tasks is broken (usually due to space on a page) and continues somewhere else. The letters or numbers or text that appears inside the connectors are matched to the mating connector where the sequence is continued.





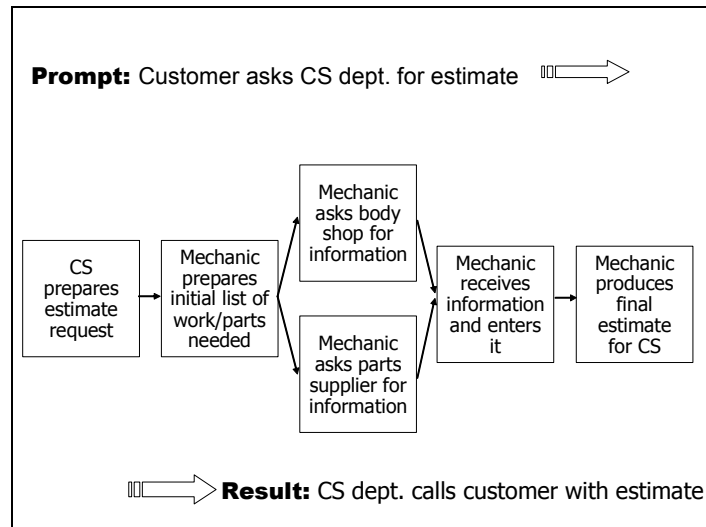
## How do task flow diagrams relate to context diagrams?

We can convert context diagrams, or parts of them, into task flow diagrams simply by changing the graphical look of them. For example, in the previous section, *Introduction to Context Analysis*, we constructed the following context diagram:



**Figure 9a**

Converting this context diagram to a workflow diagram gives us something that looks like this:



**Figure 9b**

Workflow describes the tasks, procedural steps, organizations or people, required information, and tools needed for each step in a business process. Each box represents a step in the business process and can be comprised of multiple tasks. Task flows show the details within a workflow.

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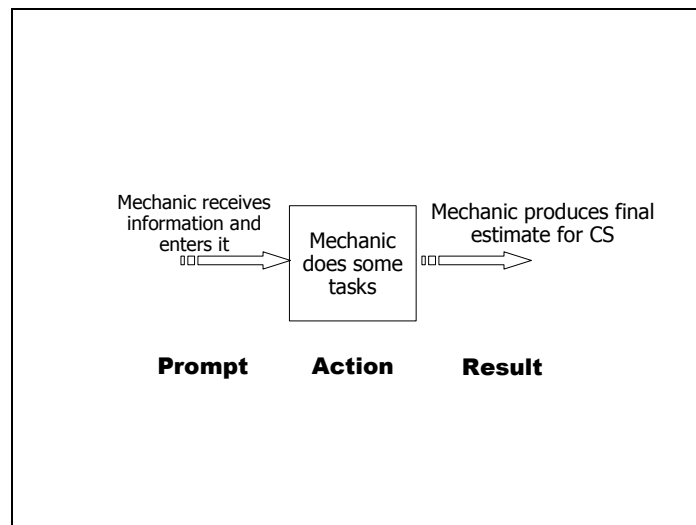
## Developing task flows

If task flow diagrams were just context diagrams in another form, there would be no need for them. However, context diagrams and flow diagrams serve two different purposes:

- Context diagrams give us an overall structure of the entire environment in which a process takes place. They help us make sure that we are identifying all entities and transactions between entities—key transfer points where information systems need to convey information.
- Flow diagrams—more specifically, task flow diagrams—help us break down the discrete tasks that occur within a particular entity. Discrete tasks are those which can be performed by an individual or group without interruption once the task has started.

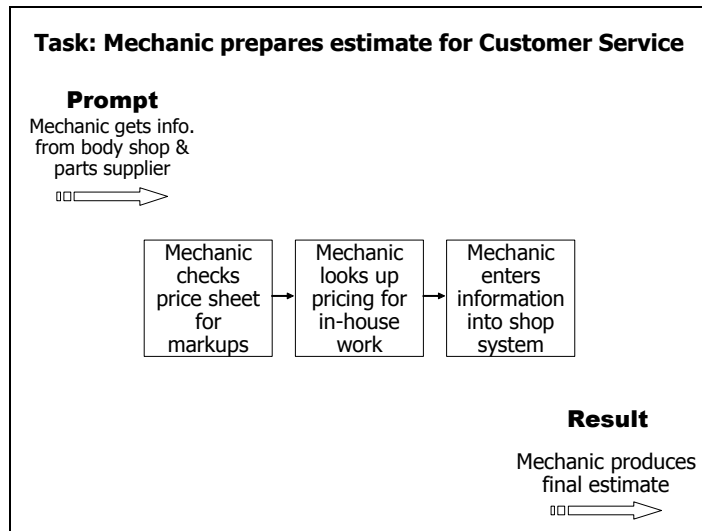
Task flow diagrams are completed for key areas of the business process (where it is important to look at the detailed activities within the process).

For example, in the workflow box in Figure 3 that reads, “Mechanic produces final estimate for CS,” there are several discrete tasks that take place *within* this box that need to be mapped out. Converting this to a simple task flow diagram would look like this:



**Figure 10**

Now, the business analyst asks a series of questions to determine what those tasks are. The result is a more specific task flow diagram that looks like this:



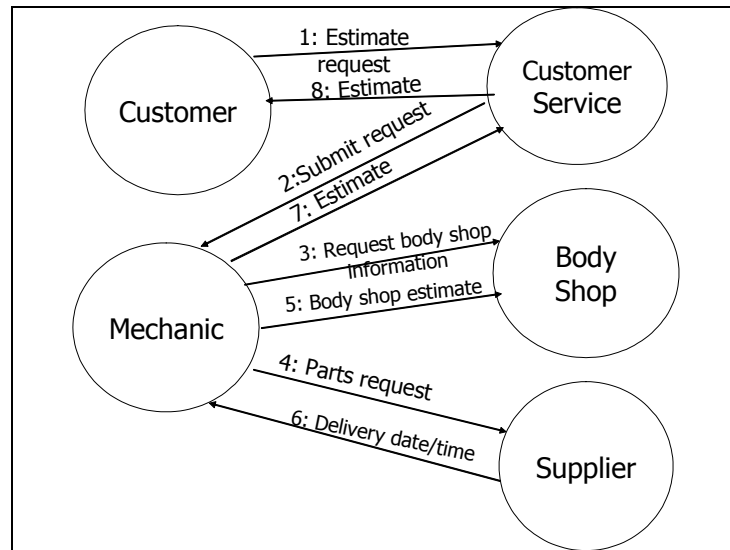
**Figure 11**

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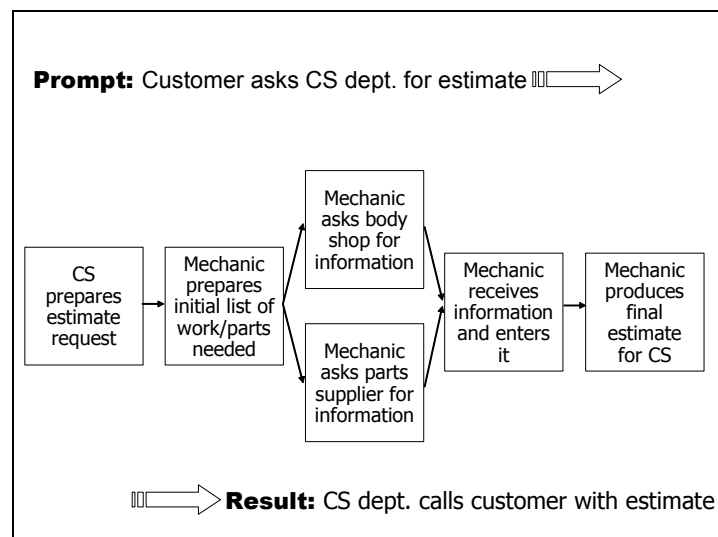
## How to Create Task Flow Diagrams

### Start with the context diagram

To create task flow diagrams, we start by creating a flowchart that is basically a repeat of the information in the context diagram, except in format—the format should be that of a flowchart, as we did when converting the context diagram to a workflow.



**Figure 12: Context Diagram**



**Figure 13: Workflow Diagram**

## Develop the workflow diagram

The flow is always from left to right or top to bottom and the diagram as a whole represents a complete, single pass through the business process.

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## Build task flows by looking at each part of the workflow diagram

Once you have the workflow diagram (Figure 13) , look at each step in the flow to determine whether it represents a single, discrete activity or multiple activities performed by an internal entity

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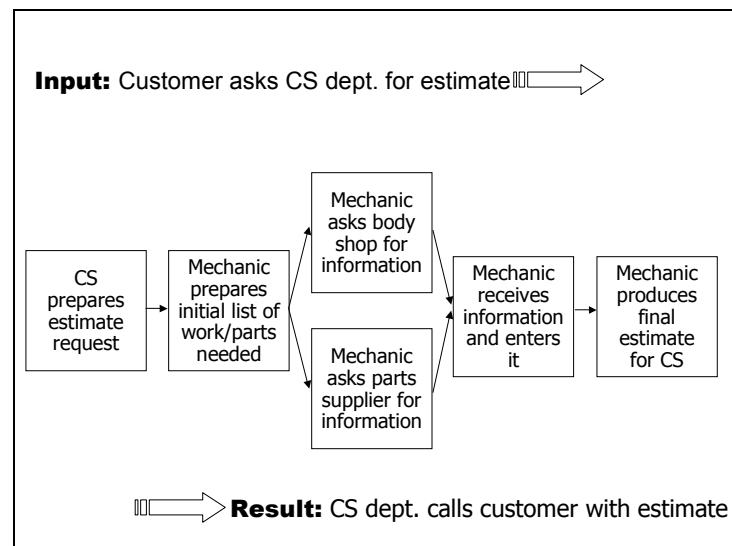
## How do we identify results?

Results from one step are used as prompts into the next sequential task and, in some cases, other downstream tasks. Frequently, one subset of the results is used in the next step and another subset used elsewhere. Results may also directly represent the achievement of the organizational objective being analyzed, that is, no additional task is required to achieve the objective. Any result directly meeting an end objective can be viewed as “the last link in the chain.”

Thus, the result from each task is used in one of three distinct ways:

- As input to the next sequential step
- As a prompt to a downstream step
- To represent the achievement of an objective.

For example, the last box in the diagram below is, “Mechanic produces final estimate for CS.”



**Figure 14**

The completion of the estimate by the mechanic serves as both a result of the task within the mechanic entity AND as a prompt for the customer service department (next box in workflow is not shown). The completion of the estimate by the customer service department serves as the result of the task within the customer service entity AND as the outcome of the business process. The outcome is the transaction that indicates the objective has been met.

### **Naming task flow diagrams**

Usually, the name of a task usually includes the entity and the result of the task. For example, the task ending with the information being sent to the outside entities (body shop and parts supplier) might be titled, "Mechanic asks body shop and supplier for information."

A note about cyclical processes: Since most data processing systems support cyclical functional environments, handling of the repeating cycles can be a stumbling block. The basic rule, however, is simple: Stop once the steps become redundant. Identify the achievement of the objective and any results from the cycle required as prompts to the next cycle. At the point where they are used as prompts, note that they are from the previous cycle. For example, when producing a monthly bank statement, the prompt is simply the balance from the previous cycle, and should be shown as such.

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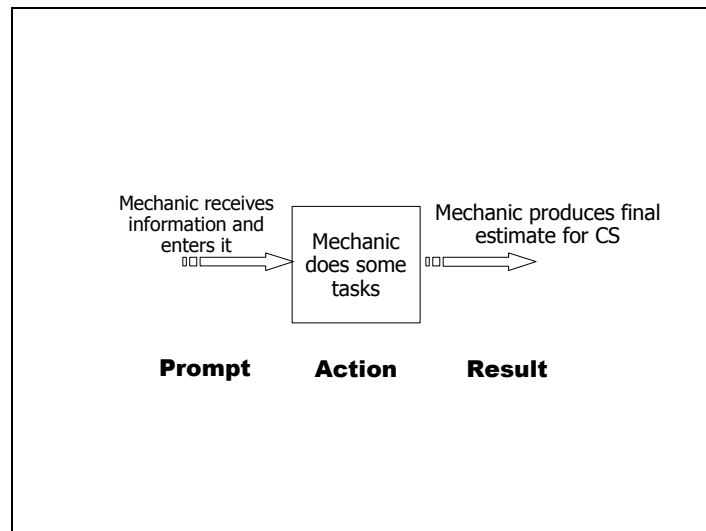
### **How do we identify prompts?**

Prompts are derived from these sources:

- Transactions on the context diagram being received by the entity performing the task. That is, all transactions with the heads of the arrows pointing at the given entity are candidates for use as prompts.
- The result from a prior process.
- Data from a previous cycle.
- Input into the process from outside the process.

Therefore, each box on our workflow diagram, except for the last one, is a prompt for a task within an entity.

In the example we talked in Figure 14, “Mechanic prepares estimate for Customer Service,” the prompt would be the result of the previous step, “body shop and supplier give information.”



**Figure 15**

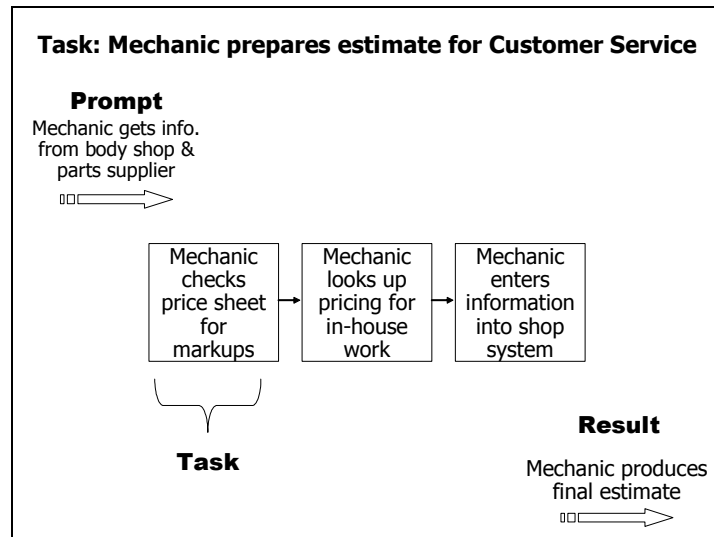
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**How do we describe the tasks that occur in transactions?**

In addition to prompts and results, the task flow diagram must also describe the actions involved to complete the actions that take place to produce the result.

Upon further examination of the mechanic’s work associated with finalizing the estimate, we discover that several tasks must be performed. First, the mechanic must check price sheets to see what the markup is on parts and auto body work. Then, s/he must look up pricing for work that will be completed in-house at the repair shop. S/he then enters this information into an estimator sheet in the shop system, which totals the information in a format for him/her to print out and give to customer service.

Thus the single transaction is shown as the following task flow:



**Figure 16**

### Completing a task set for a business process

One context diagram will produce multiple task flow diagrams. The collection of task flow diagrams that describe the activities in the business process are referred to as the task set. By working from one transaction to another, and expanding those that are most relevant to the process objectives and project scope, we gradually build a series of individual task flow diagrams that collectively describe the process.

Think carefully about how to define discrete tasks. Discrete tasks should only be delineated if they are performed by an entity under the organization's control. External entities, by definition, are not under the sponsoring organization's control. Therefore it is unlikely that the contemplated system support will support the performance of tasks undertaken by any external entity. It then follows that the workflow description is sufficient for all activities performed by external entities.

For example, we would NOT develop a task flow diagram for "body shop and supplier give information" (fourth step in Figure 14)," because we are not concerned about the activities that the body shop and parts supplier (external entities) perform to get the information, only that the information comes back to us.



Even if an activity is performed by an internal entity it is necessary to break it down further only if the activity defines multiple, unique tasks that should be broken out separately. The rule most helpful in this situation is to evaluate the activity in terms of whether or not it represents a discrete work activity that requires a prompt from which results intended to be passed to another person, or group, are produced. Visualize it as a desk with an in-basket and an out-basket. As long as the work involves using the contents of the in-basket to create a result that ends up in the out-basket, it is a single unit of work no matter how many individually identifiable steps are required to produce the result. For example, if the person performing the work prepares a document that is used internally to perform a subsequent step, the entire sequence should be treated as a single unit of work, or task.

The key words in the determination of discrete tasks are *continuous* and *uninterrupted*. If the task can be performed by an individual or group from beginning to end without interruption (continuous from beginning to end) then it is a discrete work activity.

One transaction may result in multiple task flow diagrams. Discrete tasks performed within a given entity would not show up on the business process workflow because it would require a subdivision of the natural entity. Thus the "Order Entry Department" would have to appear as "Jane's Desk", "Sally's Desk", and "Joe's Desk" if there were three discrete tasks performed on order entry. For example if Jane took the orders over the phone, Sally verified the product codes and price, and Joe formally approved the order then there would be three discrete tasks performed in sequence within the order entry department. To reflect these transactions on the context diagram would require the creation of artificial entities; the distinction should be spelled out here, during task flow diagramming.

### **Keeping track of the work**

Whenever a transaction from the context diagram is used as a prompt into a task series, it should be "crossed off" the context diagram, although it can be used multiple times. At the end of task flow diagramming, all transactions should appear at least once in the task set. Thus all transactions should be "crossed off" at the end of task flow diagramming.

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